

66. (New) The computer program product according to claim 61, wherein said low-transmission phase-shift feature comprises a 5-8% transmission attenuated phase-shift feature.

67. (New) The computer program product according to claim 61, wherein said low-transmission phase-shift feature comprises a non-phase-shifting chrome feature.

68. (New) The computer program product according to claim 61, wherein said chromeless phase-shift feature exhibits 100% transmission.

## **R E M A R K S**

### **I. Introduction**

In response to the pending Office Action, Applicants have cancelled claims 1-35, without prejudice, and added new claims 36-68, of which claims 36, 44, 53 and 61 are independent. No new matter has been added.

For the reasons set forth below, it is respectfully submitted that all pending claims are patentable over the cited prior art references.

### **II. The Rejection Of The Claims Under 35 U.S.C. § 112, Second Paragraph**

Claims 1-18 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for the recitation and use of the term "mask" in the preamble of the claims and in the body of the claims, as explained on page 2 of the Office Action. Each of the new claims 36-68 have been drafted so as to eliminate this issue. As such, it is respectfully requested that the rejection is overcome by new claims 36-68.

### III. New Claims 36-68 Are Patentable Over The Cited Prior Art

For the following reasons, Applicants respectfully submit that new claims 36-68 are patentable over the cited prior art references.

As recited by each of the pending independent claims, the present invention relates to a mask (or a method of making the mask), which is utilized to transfer a target pattern to a substrate, such as a wafer, and which comprises a first pattern corresponding to at least one non-critical feature to be printed on the wafer, where the first pattern comprises either a low-transmission phase-shift mask feature or a non-phase-shifting mask feature formed on the substrate, and a second pattern corresponding to at least one critical feature to be printed on the wafer, ***where the second pattern comprises a chromeless phase-shift mask feature generated by etching said substrate***. Importantly, by utilizing the chromeless phase-shift mask feature in the hybrid mask of the present invention to image the critical feature, the present invention simplifies the mask making process relative to prior art mask formation techniques, thereby resulting in a time and cost savings with regard to forming the hybrid mask. Moreover, the utilization of the 100% transmission chromeless phase-shift area to image the critical feature results in improved imaging of the critical feature.

#### A. **Nakao**

Turning to Nakao, while this reference discloses a hybrid mask, the mask of Nakao comprises two different types of low-transmission phase-shift mask features.

However, Nakao does not disclose the use of a chromeless phase-shift mask feature created by etching the substrate on which the mask is formed.

More specifically, Nakao discloses a hybrid mask comprising a Levenson type phase-shift mask feature and a halftone-type phase-shift mask feature. Referring to Fig. 1 of Nakao, the Levenson type phase-shift mask is a typical attenuated phase-shift mask comprising chrome features 5 surrounded by phase-shifted and non-phase-shifted areas  $Tn_1$  and  $Ta_1$ . As the Levenson portion of the mask utilizes chrome features, it is clear that this portion of the mask corresponds to a low-transmission phase-shift mask. The halftone portion of the mask comprises a semi-transparent film 3 disposed intermittently on the substrate (i.e., in accordance with the desired pattern) so as to form two different light transmitting regions,  $Tn_2$  and  $Ta_2$ . Importantly, however, the substrate in the  $Tn_2$  region of the halftone portion of the mask is not etched. Moreover, in the embodiment detailed in Nakao, the semi-transparent film is an  $MoSiO_xN_y$  film having a 4% transmission coefficient.

Thus, in contrast to the claimed invention, both the Levenson portion and the halftone portion of the mask of Nakao are low-transmission phase-shift masks. Moreover, it also clear that the halftone portion of the mask, is not created by etching the substrate on which the mask is formed.

Accordingly, at a minimum, Nakao fails to disclose the use of a chromeless phase-shift mask feature created by etching the substrate on which the mask is formed as recited by each of the independent claims. As such, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, ***Kalman v.***

**Kimberly-Clark Corp.**, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), for the foregoing reasons, it is clear that Nakao does not anticipate any of the amended independent claims, or any claim dependent thereon.

**B. Lin**

Similar to Nakao, Lin discloses a hybrid mask which comprises two different types of low-transmission phase-shift mask features. However, as with Nakao, Lin does not disclose the use of a chromeless phase-shift mask feature created by etching the substrate on which the mask is formed.

More specifically, Lin discloses a hybrid mask which utilizes a non-phase-shift mask to image densely spaced lines, and a low transmission phase-shift mask to image isolated lines. Specifically, referring to Fig. 5B of Lin, opaque mask features 213 are utilized to print the densely spaced lines, and attenuated phase-shifting material 214 is utilized to print the isolated lines. However, the attenuated phase-shifting material 214 is formed of, for example,  $\text{MoSiO}_n$ , which typically has a 6% transmission coefficient. Thus, the isolated features of Lin are also printed utilizing a low-transmission phase-shifting mask. Moreover, it is clear that Lin does not disclose forming a chromeless phase-shift mask by etching the substrate.

Thus, in contrast to the claimed invention, both of the two different phase-shift portions contained in the Lin mask are low transmission phase-shift masks, and neither portion of the Lin mask is created by etching the substrate on which the mask is formed.

Accordingly, at a minimum, Lin fails to disclose a hybrid mask having in-part a chromeless phase-shift mask feature created by etching the substrate on which the mask is formed as recited by each of the independent claims. As such, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, ***Kalman v. Kimberly-Clark Corp.***, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), for the foregoing reasons, it is clear that Lin does not anticipate any of the amended independent claims, or any claim dependent thereon.

Furthermore, as *each and every limitation must be disclosed or suggested* by the prior art reference in order to establish a *prima facie* case of obviousness (see, M.P.E.P. § 2143.03), and at a minimum, both Nakao and Lin fail to disclose or suggest forming a hybrid mask having in part a chromeless phase-shifting portion created by etching the substrate, it is submitted that the present invention is patentable over the combination of Nakao and Lin.

Accordingly, for all of the foregoing reasons, it is respectfully submitted that all pending claims are patentable over Nakao and Lin, taken alone or in combination with one another.

#### IV. Conclusion

Accordingly, it is urged that the application is in condition for allowance, an indication of which is respectfully solicited.

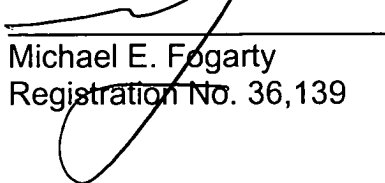
If there are any outstanding issues that might be resolved by an interview or an

Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

Respectfully submitted,

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